REMARKS

This application has been carefully reviewed in light of the Office Action dated October 31, 2008. Claims 1, 4 to 12, 15 to 23 and 26 to 33 are pending in the application, of which Claims 1, 12 and 23 are independent. Reconsideration and further examination are respectfully requested.

Claims 1, 2, 4 to 13, 15 to 24 and 26 to 33 were rejected under 35 U.S.C. § 112, second paragraph, as allegedly being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claims 1, 2, 4 to 14, 15 to 24 and 26 to 33 were rejected under 35 U.S.C. § 112, first paragraph, as failing to comply with the written description requirement. Specifically, the claims allegedly contain subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. Without conceding the correctness of the rejection, Applicant submits that the foregoing amendments obviates the rejection. Accordingly, Applicant respectfully requests reconsideration and withdrawal of the rejection.

Claims 1, 5, 11, 12, 22, 23 and 33 were rejected under 35 U.S.C. § 103(a) over U.S. Patent No. 6,181,445 (Lin) in view of U.S. Patent No. 6,728,401 (Hardeberg). Claims 2, 4, 6 to 10, 13, 15 to 21, 24 and 26 to 32 were rejected under 35 U.S.C. § 103(a) over Lin in view of Hardeberg, and in further view of U.S. Patent No. 5,539,540 (Spaulding). Reconsideration and withdrawal of this rejection are respectfully requested.

The present invention concerns the management of devices that generate color images such as color input devices such as scanners and digital cameras. In one aspect of the

invention, the response of a color input device to a color target is used to create a mathematical transformation for transforming the color values generated by the color device in a device-dependent color space to color values in a device-independent color space. As these color transformations are typically composed of low-order polynomials that are used for both interpolation and extrapolation, a transformed color value in the device-independent color space may not correspond to a valid color value in the device-independent color space. The present invention provides for a way to manage at least two types of invalid color values. In one case, the transformed color value may have a luminance value less than zero, in which case both the luminance value and any chromaticity values are set to zero, in essence setting the color value to indicate no color or brightness at all. In another case, the transformed color value may be invalid because it represents a "color" that is not perceivable by a human being. In this case, the transformed color value is limited or clipped to a boundary of a defined spectral locus in the device-independent color space.

Turning to specific claim language, amended independent Claim 1 is directed to a method of transforming device-dependent color values in a device-dependent color space of a color input device to device-independent color values in a device-independent color space. The method comprises providing a mathematical transformation for converting device-dependent color values in a device-dependent color space of the color input device to device-independent color values in the device-independent color space, converting an input device-dependent color value in the device-dependent color space generated by the color input device into a device-independent color value in the device-independent color space using the mathematical model and determining whether or not the device-independent color value has a luminance component less than zero. When it is determined that the luminance component is less than zero, the luminance

component is set to zero and chromaticity components of the device-independent color value are set to zero. When it is determined that the luminance component is not less than zero, then it is determined whether or not the device-independent color value is outside a spectral locus in the device-independent color space.. When it is determined that the device-independent color value is outside the spectral locus, the device-independent color value is clipped to another device-independent color value in the device-independent color space on the spectral locus.

Applicant respectfully submits that Lin and Hardeberg, whether considered alone or in combination, are not seen to disclose or to suggest all of the features of independent Claim 1. In particular, Lin and Hardeberg are not seen to disclose or to suggest at least the features of providing a mathematical transformation for converting device-dependent color values in a device-dependent color space of the color input device to device-independent color values in the device-independent color space, converting an input device-dependent color value in the device-dependent color space generated by the color input device into a device-independent color value in the device-independent color space using the mathematical model and determining whether or not the device-independent color value has a luminance component less than zero. When it is determined that the luminance component is less than zero, the luminance component is set to zero and chromaticity components of the device-independent color value are set to zero. When it is determined that the luminance component is not less than zero, then it is determined whether or not the device-independent color value is outside a spectral locus in the device-independent color space.. When it is determined that the device-independent color value is outside the spectral locus, device-independent color value is clipped to another device-independent color value in the device-independent color space on the spectral locus.

In contrast, Lin merely discloses typical gamut mapping as used in an initial stage of a color management pipeline. In Lin, two techniques are disclosed that operate on device-independent color values in order to prepare them for output on a color output device. One technique is what Lin terms "normalize" and the other is termed "compress."

For "normalize", Lin discloses a degree of media independence may be achieved by accounting for differences in the "white point" for respective media. Lin discloses that this may be accomplished by simply converting values from CIE XYZ space into CIE L*a*b* space. (See Lin, Fig. 9 and paragraphs [0091] to [0094]). That is, Lin assumes that the input device map 21 successfully transforms all input color values into valid color values in the CIE XYZ color space. In the present invention, no such assumption is made. Instead, the device-independent color values generated using the mathematical transformation are checked to determine if the have luminance values less than zero and are clipped such that their luminance and chromaticity values are set to zero. Such a feature is not found in Lin.

Furthermore, Lin discloses that "compress" accounts for differences in the range of luminance levels for input- and output-device gamuts. In "compress", out-of-gamut colors are mapped to the minimum luminance level for a neutral color in the color output device gamut. Alternatively, such colors may be mapped into the color output device gamut by compressing the luminance level. Lin discloses that "compress" tends to remove artifacts from the replica that are created by noise in the scanning process and by arithmetic round off errors in the transformation processes. This operation may also be used to remove the background color of the original medium without changing the colors of the reproduced image. (See Lin, Fig. 9 and paragraphs [0096] to [0101]).

Therefore, by using "normalize" and "compress", Lin discloses that the color gamuts of the color input device and the color output device may be matched to each other. However, Lin fails to acknowledge that the input device map may generate invalid color values, much less how to manage the invalid color values by setting luminance and chromaticity values to zero or by clipping an out of bounds color value to a boundary of a spectral locus as featured in the present invention.

Applicant has reviewed Hardeberg and submits that it does not cure the deficiencies of Lin. In Hardeberg, methods for reducing "red eye" are disclosed. As part of one method, "contrast stretching" is used. In contrast stretching, pixels that have been identified as belonging to a pupil of an eye and having a minimum luminance values are extrapolated to another, lower luminance value, in order to darken them to black. If the process overshoots, the luminance value may be negative, in which case the value is set to zero. However, this is not the same as determining whether or not a transformed device-independent color value has a luminance component less than zero and, when it is determined that the luminance component is less than zero, clipping the luminance component to zero and setting chromaticity components of the device-independent color value to zero. This is because, in Hardeberg, the starting pixel color values are all valid, that is, they are all color values in a color space that correspond to valid colors. In the present invention, only invalid color values resulting from a mathematical transformation from a device-dependent color space to a device-independent color space are identified and adjusted. As in Lin, Hardeberg is completely silent regarding the problem of invalid color values. Therefore, it cannot be said that Hardeberg discloses or suggests setting the luminance and chromaticity values of a color value to zero nor clipping a color value outside of a spectral locus to the boundary of the spectral locus as featured in Claim 1.

In light of these deficiencies in Lin and Hardeberg, Applicant submits that amended independent Claim 1 is now in condition for allowance and respectfully requests same.

Amended independent Claims 12 and 23 are directed to a data processing system and a computer-readable medium, respectively, substantially in accordance with the method of Claim 1. Accordingly, Applicant submits that Claims 12 and 23 are also now in condition for allowance and respectfully requests same.

The other pending claims in this application are each dependent from the independent claims discussed above and are therefore believed allowable for the same reasons. Because each dependent claim is also deemed to define an additional aspect of the invention, however, the individual consideration of each dependent claim on its own merits is respectfully requested.

In view of the foregoing amendments and remarks, the entire application is believed to be in condition for allowance, and such action is respectfully requested at the Examiner's earliest convenience.

CONCLUSION

No claim fees are believed due; however, should it be determined that additional claim fees are required, the Director is hereby authorized to charge such fees to Deposit Account 06-1205.

Applicant's undersigned attorney may be reached in our Costa Mesa, CA office at (714) 540-8700. All correspondence should continue to be directed to our below-listed address.

Respectfully submitted,

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